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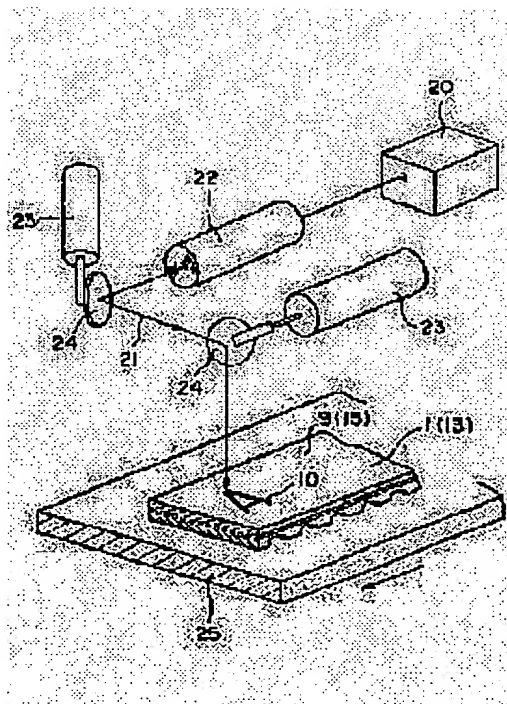
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(54) MOTIVE POWER TRANSMITTING BELT HAVING MARK AND MARK STAMPING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To leave a clear mark even if a belt back face is used as a driving surface, and prevent the deterioration of a mechanical characteristic of a belt by stamping the mark by irradiating a painting laser beam to the back face becoming the driving surface.

SOLUTION: A printing laser beam 21 oscillated from a laser oscillating part 20 is condensed to a condenser lens 22, and a laser spot is minimized on a surface, and a scan mirror 24 is scanned by a control part 23, and while adjusting an angle of reflection of the laser beam 21, it is irradiated to a back face 9(15) of a belt 1(13) arranged on a movable support stand 25, and a mark 10 is stamped in a prescribed range. This resembles the principle of printing a surface, and the irradiated laser beam 21 instantly melts and gasifies a very small part of the back face 9(15), and forms a recess. Since there is no need to irradiate a strong laser beam 21 for many hours, a constitutive member of the belt, for example, a conductor or the like is not damaged by heat.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a power transmission belt with a mark, and the mark stamp approach, and is set in detail to power transmission belts, such as a belt with a gear tooth, a flat belt, and V ribbed belt. Without damaging the configuration member of a belt fatally, in the tooth back which a pulley is made to contact and is used as a drive side, engrave a mark, other fields and level differences cannot be found, either, and a flat side is maintained at it. The tooth-back drive with little noise is enabled, and it is related with the power transmission belt with a mark whose reading whose mark is clear and is always possible, and the mark stamp approach.

[0002]

[Description of the Prior Art] The imprint mark to which the non-vulcanized color rubber used as a mark was made to adhere on the base material of a transparent synthetic-resin film as an approach of attaching a mark to the tooth back of the conventional power transmission belt After sticking on a shaping drum, the mark was imprinted on the front face of covering sail cloth with rubber by fitting in covering sail cloth with rubber, twisting an elongation rubber layer, core wire, and a compression rubber layer, fitting in a jacket, vulcanizing subsequently to this, and stripping the film of an imprint mark from the vulcanized belt sleeve.

[0003] However, during vulcanization, since the rubber of the imprint mark which upheaved from the base material and the base material was pressed fit in the tooth back of a belt sleeve, the field which the level difference pattern after stripping a base material is formed in a tooth back, and has a mark changed into the condition of having become depressed slightly. The level difference arose between the fields which are not made into the field which imprinted the mark in a belt tooth back, and it did not become a flat field. While the latest V ribbed belt is used as an object for the auxiliary machinery drive of an automobile and being twisted in the shape of Sir pen teens especially by multiaxial drive, in order to make a tensioner engage with a belt tooth back, when the concave convex was in such a belt tooth back, said tensioner vibrated and had emitted the noise. Not only it but the belt tooth-back drive which uses a belt tooth back had the problem to which the noise at the time of belt driving becomes large.

[0004] for this reason, to JP,7-96330,B The imprint mark material which made the mark adhere on a base material, and the sail cloth containing an unvulcanized rubber After carrying out heating pressurization of superposition and this so that this mark may face sail cloth, exfoliate a base material and this mark is beforehand imprinted to sail cloth. The mark material which the approach of using this sail cloth at the time of shaping of a belt is indicated [material], and made the mark adhere to JP,8-152048,A on the base material of a nonwoven fabric is made to adhere to the covering sail cloth of a belt, and the approach of making mark material and covering sail cloth one is proposed.

[0005] Moreover, recently, the approach of printing a mark at a direct belt tooth back using an ink jet printer is indicated by JP,7-233992,A, without using mark material. This is the approach of what was specifically cut from the belt sleeve to constant width being prepared, and a fixed number of these being arranged in on belt susceptor, fixing, moving this susceptor to a predetermined location, operating an ink

jet printer, turning ink to the above-mentioned belt, injecting [print a mark by injecting ink directly at a belt tooth back with an ink jet printer,] it from that ink head, and printing a desired mark.

[0006]

[Problem(s) to be Solved by the Invention] However, when imprinting the mark at the belt tooth back, or making the belt tooth back to which the mark was attached contact a pulley by the approach of making imprint mark material a belt and one and using it as a drive side, the problem become to decipherment impossible soon after belt transit was also in the mark a mark is ground by the pulley, become easy to disappear, and contain a special manufacture marker, a trade name, manufacture years, and manufacture lot No. Moreover, also by the approach of printing a mark at a direct belt tooth back using an ink jet printer, since a pulley was worn out in homogeneity in a belt tooth back, there was a problem on which a mark disappears.

[0007] It aims at offering the power transmission belt with a mark which this invention improves such a trouble, the flat side where neither residual ****, the field which moreover attached the mark nor the field which is not so has a level difference in a clear mark maintains [belt], and decreases the noise of a tooth-back drive side even if a belt tooth back is used as a drive side, and does not worsen the mechanical property of the belt by the exposure of a laser beam, and the mark stamp approach.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention which relates to claim 1 among this inventions In the power transmission belt which prepared the mark in the tooth back which turns into a drive side in contact with a pulley Even if it is the power transmission belt with a mark which the mark obtained by irradiating a laser beam is stamped on the above-mentioned tooth back, and other fields and level differences do not have the field where a mark exists, either, and is maintaining the flat side and a belt tooth back is used for a drive side As for the mark stamped on the predetermined depth in this field, during after belt transit does not disappear.

[0009] Invention concerning claim 2 is not cut by the laser beam which fiber members, such as core wire and sail cloth, irradiated since the depth of the stamped mark was 0.1-1mm, and the mechanical property of a belt does not receive a bad influence, either.

[0010] Also when the power transmission belt with a mark with which the tooth back which stamps a mark is formed in the rubber layer has invention concerning claim 3, and crack initiation cannot happen from the hollow of the mark stamped on the rubber layer easily and a mark is stamped, members, such as sail cloth, are not cut by the laser beam and the mechanical property of a belt does not change, either.

[0011] Invention concerning claim 4 is the power transmission belt with a mark which adhered the coating which has a color which is different from a tooth back in the hollow of the stamped mark, and a mark pattern becomes still clearer.

[0012] A mark can apply invention concerning claim 5 to the belt with a gear tooth stamped on the tooth-back rubber layer of the belt with a gear tooth formed from the tooth-back rubber layer which laid core wire underground, and the tooth part prepared at the predetermined spacing.

[0013] A mark can apply invention concerning claim 6 to the flat belt stamped on the tooth-back rubber layer of a flat belt. It is and is **.

[0014] In the mark stamp approach of a power transmission belt of having prepared the mark in the tooth back at which invention concerning claim 7 serves as a drive side in contact with a pulley Irradiate a laser beam at the rubber layer of the above-mentioned tooth back, adjusting whenever [angle-of-reflection] by at least one scanning mirror, and a mark is stamped. By being in the mark stamp approach of a power transmission belt of having made it not damage the fiber member laid under the rubber layer, and adjusting the depth of a mark Even if cannot do fatal damage, and it can stamp it on fiber members, such as core wire and sail cloth, and a tooth back is used for a drive side, as for the mark stamped on the predetermined depth in this field, during after belt transit will not disappear.

[0015] The mark stamp approach of a power transmission belt of having stamped the mark with a depth of 0.1-1mm on the tooth-back rubber layer of the belt with a gear tooth formed from the tooth-back rubber layer which laid core wire underground, and the tooth part prepared at the predetermined spacing has invention concerning claim 8, it can do and stamp fatal damage on core wire, and does not reduce

the mechanical property of the belt after a laser beam exposure.

[0016] Invention concerning claim 9 is the mark stamp approach of a power transmission belt of making a power transmission belt standing it still, during the exposure of a laser beam.

[0017]

[Embodiment of the Invention] Drawing of the operation gestalt of this invention is used and explained below. the regions of back under which drawing 1 is the cross-section perspective view of the belt with a gear tooth which is one of the power transmission belts with a mark concerning this invention, and the belt 1 with a gear tooth laid two or more tooth parts 2 and core wire 3 along with the belt longitudinal direction -- it consists of a tooth cloth 5 which covered 4, the tooth part front face 6, and the front face of the bottom section 7.

[0018] The rubber used for said tooth part 2 and regions-of-back 4 has desirable rubber with which heat-resistant aging nature, such as chlorosulfonated polyethylene (CSM) including hydrogenated nitrile rubber, alkylation chlorosulfonated polyethylene (ACSM), and chloroprene rubber, has been improved. The rate of hydrogenation is 80% or more, and 90% or more of hydrogenated nitrile rubber is good in order to demonstrate thermal resistance and the property of ozone resistance. Thermal resistance and ozone resistance fall [hydrogenated nitrile rubber of less than 80% of rates of hydrogenation] to the degree of pole. Although carbon black, a zinc white, stearin acid, a plasticizer, an antioxidant, etc. are added as a compounding agent in the above-mentioned rubber and there are sulfur and organic peroxide as a vulcanizing agent, especially these compounding agents or vulcanizing agents are not restricted.

[0019] As the above-mentioned core wire 3, what twisted the 5-9-micrometer filament of E glass or high intensity glass is processed with the RFL liquid which is the protective agent or adhesives which consists of a rubber composition. moreover, as organic fiber, elongation was small, and twisted the filament which is 0.5-2.5 deniers of the Para system aramid fiber (trade name: Kevlar, theque NORA) with large tensile strength to stress, and it was processed with the adhesives of RFL liquid, an epoxy solution, an isocyanate solution, and a rubber composition -- it twists and a code is used. However, in this invention, it is not limited to these. the diameter of the above-mentioned core wire 3 -- 0.6-1.10mm -- although an entry is carried out, in less than 0.6mm, the tensile strength of core wire 3 is low, and heavy load transmission cannot be borne. On the other hand, if 1.10mm is exceeded, it will not be materialized on a belt dimension.

[0020] the sail cloth used as a tooth cloth 5 is 6 nylon, 66 nylon, polyester, an aramid fiber, etc., and is independent -- or it may be mixed. The configuration of the warp (belt cross direction) of a tooth cloth 5 or the woof (the belt die-length direction) is also the filament yarn or spun yarn of said fiber, and, as for either, ***** is also good by the plain weave fabric, the twill object, and the satin object. In addition, it is desirable to use a part of urethane elastic yarn which has elasticity for the woof.

[0021] The above-mentioned tooth cloth 5 is processed by RFL liquid, an isocyanate solution, or the epoxy solution. RFL liquid is latexes, such as a styrene . butadiene . vinylpyridine ternary polymerization object, hydrogenated nitrile rubber, chlorosulphonated polyethylene, and epichlorohydrin, as a latex which is mixed to a latex and uses the initial condensate of resorcinol and formalin here.

[0022] a deer -- carrying out -- the belt 1 with a gear tooth of this invention -- setting -- regions of back - 4 consisted of a rubber layer, the tooth back 9 which is the outside surface turned into a drive side which contacts a pulley, and the mark 10 represented by a trademark, manufacture years, a lot number, grade, etc. is stamped. The depth is 0.1-1mm, a laser beam is irradiated, the stamped mark 10 is obtained so that it may mention later, when affecting the mechanical property of the tension strength of a belt etc., it becomes important, and in less than 0.1mm, when wear of a tooth back 4 advances, it has **** to which a mark 10 disappears. if it exceeds 1mm on the other hand -- a laser beam -- regions of back -- there is a danger of having a thermal bad influence on the core wire 3 currently laid under 4, and the dust with which the hollow of a mark 10 tended to be covered with dust etc., and it collected during transit is emitted, and other equipments may be polluted. Moreover, although the width of character of a mark 10 is also 0.1-1mm, this can be adjusted to arbitration.

[0023] The field 11 where the mark 10 stamped on the tooth back 9 exists does not have a level

difference in the boundary section with the other field 12 evenly, either, and it is flat, and it stops also generating the oscillating noise accompanying this, without the pulley which contacts a tooth back 9 vibrating.

[0024] Drawing 2 is the cross-section perspective view of the flat belt 13 concerning this invention, this belt 13 consists of structure which laid the core wire 3, such as a rope, under the interior into the rubber layer 14, and the tooth back 15 is the drive side which a pulley is made to contact. This tooth back 15 consisted only of a rubber layer 14, and the various marks 10 represented by a trademark, manufacture years, a lot number, grade, etc. are stamped.

[0025] It is also possible to adhere the coating which has a color which is different from tooth backs 9 and 15 in the hollow of the mark 10 which the above-mentioned belt 1 with a gear tooth and the flat belt 13 stamped, and the pattern of a mark will become still clearer if it does in this way.

[0026] The approach of irradiating the above-mentioned laser beam and stamping a mark CO2 oscillated from the laser oscillation section 20 as shown in drawing 3 It carries out as [become / a laser spot / bring together the laser beams 21 for printing, such as a laser beam, in a condenser lens 22, and / on a front face / min]. Making the scanning mirror 24 scan and adjusting whenever [angle-of-reflection / of a laser beam 21] by the control section 23, the tooth backs 9 and 15 of the belts 1 and 13 installed on the movable susceptor 25 are irradiated, and a mark 10 is stamped by predetermined within the limits. the laser beam 21 which the principle that this can be burned in a front face is resembled, and was irradiated -- tooth backs 9 and 15 -- melt some rubber in an instant, it is made to evaporate very much, and a hollow 27 is formed.

[0027] In stamping the mark outside the predetermined range, after moving susceptor 25 to 1 shaft orientations in parallel, a laser beam 21 is irradiated again and it stamps the new mark 10. That is, if three characters, A, B, and C, are maximum ranges, after moving susceptor 25, other alphabetic characters will be stamped.

[0028] This laser beam 21 can draw the desired alphabetic character inputted by scanning the scanning mirror 24 automatically according to the program which the control section 23 which inputted data, such as an alphabetic character, a notation, and a graphic form, beforehand inputted, and controlling ON of a laser beam 21, and OFF, a notation, and a graphic form. Since the tooth backs 9 and 15 of a belt and the distance of the scanning mirror 24 are comparatively as short as about 100-150mm and it is not necessary to carry out the long duration exposure of the strong laser beam 21, the configuration member of a belt, for example, core wire etc., is not damaged with heat.

[0029] Drawing 4 shows the condition of having irradiated the laser beam 21 and having stamped the mark 10 on the tooth backs 9 and 15 of belts 1 and 13 by predetermined within the limits, and the hollow 27 with a depth of 0.1-1mm of a mark 10 is stamped. Thereby, cannot do fatal damage and it can be stamped on the fiber member of core wire 3.

[0030] In addition, although it does not change mechanical properties, such as tensile strength of a belt, in facing stamping a mark 10 using the above-mentioned laser beam 21 and irradiating the front face of a direct rubber layer, if a laser beam 21 is irradiated in a sail cloth side, you cut the configuration yarn of sail cloth and it is made to be damaged, and since this causes a fall for the mechanical characteristic of a belt, it is not desirable.

[0031]

[Example] Hereafter, an example explains this invention to a detail.

After giving vibration underwater and shrinking textiles after carrying out weaving of the textiles by the woof which consists of warp of 66 nylon of 1140 deniers of examples, and 66 280 deniers nylon and 140-denier urethane elastic yarn to about 1 of the width of face at the time of weaving / two pieces, it immersed and dried on the rubber cement which consists of a hydrogenated-nitrile-rubber constituent, the rubber sheet of a hydrogenated-nitrile-rubber constituent was further stuck to the above-mentioned textiles by pressure, and it considered as the tooth cloth.

[0032] Next, it was immersed in the RFL liquid which is a protective agent and adhesives, after desiccation, the bottom twist was performed and it considered as the strand, as a core wire, E glass filament of 9 micrometers of diameters of a strand was lengthened the number of predetermined, and

was arranged, the strand was lengthened the number of predetermined and arranged, with the bottom twist, the upper twist was given to hard flow and the twist code of S and Z pair was produced.

[0033] Each tooth cloth was set to the endless-like tube-like object, and finishing and this were set to metal mold. The code of S and Z pair was twisted by turns from moreover, the rolling sheet of a hydrogenated-nitrile-rubber constituent was twisted on it, by the vulcanization approach by the usual press fit, after vulcanization, the vulcanization sleeve was cut to predetermined width of face, and each belt was produced. Belt sizes were number-of-teeth:105, belt width-of-face:19.1mm, and gear-tooth pitch:8mm, and the tooth form of a belt was STPD.

[0034] Next, CO₂ which used equipment as shown in drawing 3, and was oscillated from the laser oscillation section Brought together the laser beam (12W, a class 4, wavelength of 10.6 micrometers) in the condenser lens, the scanning mirror connected with the control section was made to scan to biaxial, the tooth back of the belt on the susceptor which adjusted distance with a scanning mirror to 130mm was irradiated, and the mark with a depth of 0.5mm was stamped on the front face.

[0035] What printed the direct mark at the belt tooth back on the other hand, using an ink jet printer as a belt on which a mark is not stamped was used.

[0036] The belt with a gear tooth on which the mark was stamped, and the belt with a gear tooth which printed the mark with the ink jet printer, the multiaxial crookedness driving test machine was equipped with and run, and the existence of the mark disappearance when resulting in the life of each belt was investigated. The result is shown in Table 1.

[0037] Phase opposite is carried out and the above-mentioned multiaxial crookedness driving test machine 30 arranges the drive pulley 31 (number of teeth 24), two fixed follower pulleys 32 and 33 (each number of teeth 24), and one movable follower pulley 34 (number of teeth 24), as shown in drawing 5, and it places the AIRA pulleys 35, 36, 37, and 38 of 32mm of diameters phi of a pulley between each pulley. And as transit conditions, they are the ambient atmosphere environmental temperature C of 100 degrees, axial load 60kgf, and rotational frequency 5500rpm of a driving pulley 16.

[0038] Moreover, it attached and ran the belt with a gear tooth on which the mark was stamped, and the belt with a gear tooth which printed the mark to 3 shaft heatproof driving test, and the tensile strength of the belt after transit was measured.

[0039] This 3 shaft heatproof driving test 40 consists of a drive pulley 41 (number of teeth 21), and the follower pulley 42 (number of teeth 42) and a tension pulley 43 (diameter of pulley 52mmphi), as shown in drawing 6. A belt is twisted around a driving pulley 41 and the follower pulley 42, and it engaged with the tension pulley 43 and engine-speed 7,200rpm of the drive pulley 41 and the follower pulley 42 were run the belt tooth back with load 5ps and the belt initial tension of 15kg with the ambient atmosphere environmental temperature of 120-degreeC. And the tensile strength of the belt after 500-hour transit was measured. The result is shown in Table 1.

[0040]

[Table 1]

	マークを刻印した 歯付ベルト	マークを印刷しな い歯付ベルト
多軸屈曲走行による 走行寿命(時間)	4 3 5	4 3 0
多軸屈曲走行による マーク消失の有無	無	多く有
3軸耐熱走行試験後 のベルトの引張強さ (Kg / ベルト幅19.1mm)	9 6 0	1 0 9 0

[0041] When it depends as a result, since there is no difference compared with the belt with a gear tooth with which the belt with a gear tooth on which the mark was stamped does not have disappearance of a mark to the life of a belt, and the tensile strength of the belt after transit also printed the mark, it turns out that the mechanical characteristic of a belt is not falling by the exposure of a laser beam. However, when a mark is beginning to have disappeared in the transit time and the belt with a gear tooth which printed the mark was the life of a belt, the mark had disappeared partially.

[0042]

[Effect of the Invention] As mentioned above, invention which relates to claim 1 among this inventions In the power transmission belt which prepared the mark in the tooth back which turns into a drive side in contact with a pulley Even if it is the power transmission belt with a mark which the mark obtained by irradiating a laser beam is stamped on the above-mentioned tooth back, and other fields and level differences do not have the field where a mark exists, either, and is maintaining the flat side and a belt tooth back is used for a drive side As for the mark stamped on the predetermined depth in this field, during after belt transit does not disappear.

[0043] Invention concerning claim 2 is not cut by the laser beam which fiber members, such as core wire and sail cloth, irradiated since the depth of the stamped mark was 0.1-1mm, and the mechanical property of a belt does not receive a bad influence, either.

[0044] Also when the power transmission belt with a mark with which the tooth back which stamps a mark is formed in the rubber layer has invention concerning claim 3, and crack initiation cannot happen from the hollow of the mark stamped on the rubber layer easily and a mark is stamped, members, such as sail cloth, are not cut by the laser beam and the mechanical property of a belt does not change, either.

[0045] Invention concerning claim 4 is the power transmission belt with a mark which adhered the coating which has a color which is different from a tooth back in the hollow of the stamped mark, and the pattern of a mark becomes still clearer.

[0046] A mark can apply invention concerning claim 5 to the belt with a gear tooth stamped on the tooth-back rubber layer of the belt with a gear tooth formed from the tooth-back rubber layer which laid core wire underground, and the tooth part prepared at the predetermined spacing.

[0047] A mark can apply invention concerning claim 6 to the flat belt stamped on the tooth-back rubber layer of a flat belt. It is and is **.

[0048] Invention concerning claims 7-9 is the mark stamp approach of a power transmission belt, and a laser beam is irradiated at the rubber layer of the above-mentioned tooth back, adjusting whenever [angle-of-reflection] by at least one scanning mirror. By being in the mark stamp approach of a power transmission belt of having made it not damage the fiber member which stamped the mark and was laid under the rubber layer, and adjusting the depth of a mark to 0.1-1mm Even if cannot do fatal damage, and it can stamp it on fiber members, such as core wire and sail cloth, and a belt tooth back is used for a drive side, as for the mark stamped on the predetermined depth in this field, during after belt transit will not disappear.

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CLAIMS

[Claim(s)]

[Claim 1] The power transmission belt with a mark characterized by stamping the mark obtained by irradiating a laser beam on the above-mentioned tooth back in the power transmission belt which prepared the mark in the tooth back which turns into a drive side in contact with a pulley, and for the field where a mark exists not having other fields and level differences, either, and maintaining the flat side.

[Claim 2] The power transmission belt with a mark according to claim 1 whose depth of the stamped mark is 0.1-1mm.

[Claim 3] The power transmission belt with a mark according to claim 1 or 2 with which the tooth back which stamps a mark is formed in the rubber layer.

[Claim 4] The power transmission belt with a mark according to claim 1, 2, or 3 which adhered the coating which has a color which is different from a tooth back in the hollow of the stamped mark.

[Claim 5] Claims 1 and 2 stamped on the tooth-back rubber layer of the belt with a gear tooth formed from the tooth-back rubber layer under which the mark laid core wire, and the tooth part prepared at the predetermined spacing, or a power transmission belt with a mark given in three.

[Claim 6] Claims 1 and 2 by which the mark is stamped on the tooth-back rubber layer of a flat belt, or a power transmission belt with a mark given in three.

[Claim 7] The mark stamp approach of the power transmission belt characterized by making it not damage the fiber member which irradiated the laser beam at the rubber layer of the above-mentioned tooth back, adjusting whenever [angle-of-reflection] by at least one scanning mirror, stamped the mark in the mark stamp approach of a power transmission belt of having prepared the mark in the tooth back which turns into a drive side in contact with a pulley, and laid under the rubber layer.

[Claim 8] The mark stamp approach of a power transmission belt according to claim 7 of having stamped the mark with a depth of 0.1-1mm on the tooth-back rubber layer of the belt with a gear tooth formed from the tooth-back rubber layer which laid core wire underground, and the tooth part prepared at the predetermined spacing.

[Claim 9] The mark stamp approach of a power transmission belt according to claim 7 or 8 of making a power transmission belt standing it still during the exposure of a laser beam.

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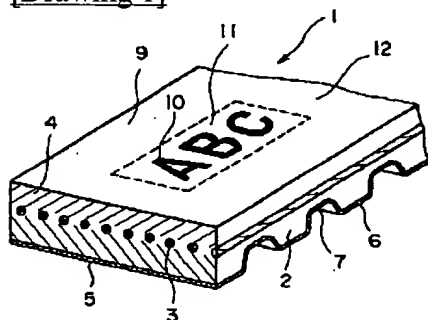
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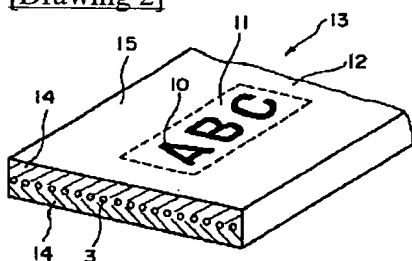
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DRAWINGS

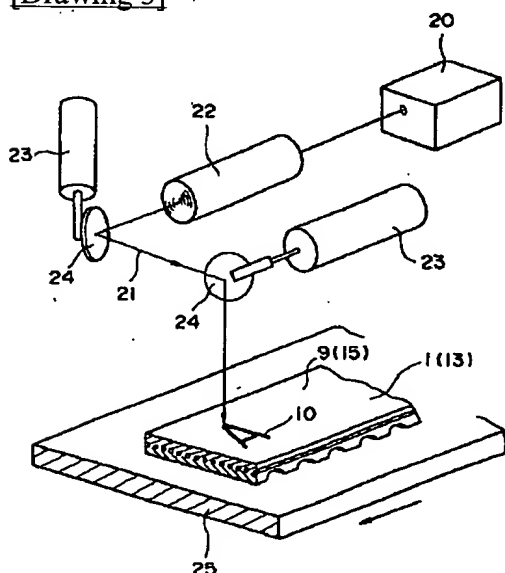
[Drawing 1]



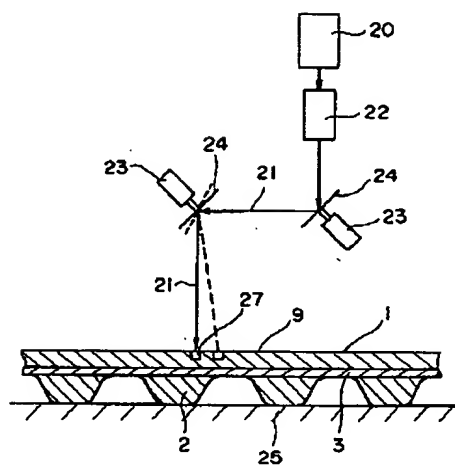
[Drawing 2]



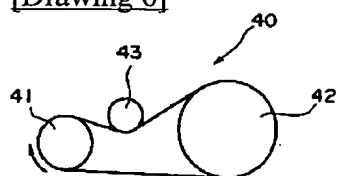
[Drawing 3]



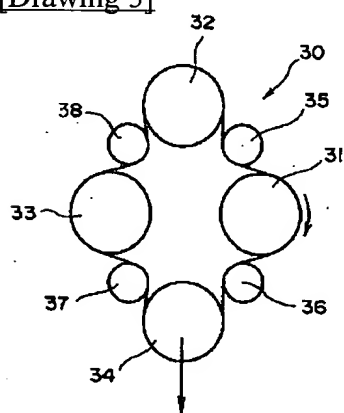
[Drawing 4]



[Drawing 6]



[Drawing 5]



[Translation done.]